

**A STUDY TO DETERMINE REFLEX TIME OF RESPONDING
EMERGENCY PERSONNEL FOR THE ALHAMBRA FIRE
DEPARTMENT**

EXECUTIVE LEADERSHIP

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ABSTRACT

During a recent initiative to consolidate the Alhambra Fire Department with the Los Angeles County Fire Department, there were numerous questions and debates on service levels that each agency provides. At the core of almost each question were response times, and this would lead to major discussions on service levels between the citizens and fire department representatives. The problem for Alhambra Fire Department was to identify our response times in quantifiable terms and times.

The purpose of this research project was to determine the reflex time of responding emergency personnel. By establishing the components and developing a standard of measurement for reflex time the department will be able to more accurately account for response time components within the time frames from the time of entry to the time arrived. The reflex time standard will also be integrated into performance objectives for responding emergency personnel.

Evaluative and action research methodologies were used in this research to answer the following questions:

1. What is reflex time?
2. What components make up the reflex time?
3. What is the reflex time of responding personnel?
4. What is an acceptable reflex time standard?

A 10% sample population of 4,734 incidents, producing 927 response times from the fiscal year July 1, 1997 to June 30, 1998 was evaluated. The data was analyzed to determine the components that make up a reflex time and develop a standard of

measurement for reflex time.

The results identified the components within the reflex time frame, establishing reflex time measurements. The findings of the research support the development of a reflex time standard to provide a more accurate accounting of response times and set performance objectives for emergency responders.

It was recommended to develop a reflex time standard from the findings of this study to establish department and emergency responder performance objectives. The department should implement a reflex time standard and institutionalize the reflex time as a critical component in reporting and accounting for the total response times.

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INTRODUCTION

In 1997, the Alhambra Fire Department was involved in an initiative process to consolidate their fire and emergency medical service with the Los Angeles County Fire Department. On December 16, 1997, the citizens of Alhambra voted overwhelmingly to maintain their own fire and emergency medical services by 76%. During the initiative process, there were numerous debates on the service levels between the Los Angeles County Fire Department and the Alhambra Fire Department. The one specific level of service at the core of almost every debate was response times. During these debates, the question of “how long does it take to respond to an incident” was answered in generalities without identifying the specific components that make up an incident response time. The response times that were presented to citizen groups and the media was the time of dispatch till time of arrival (received in the fire station and the travel time to the incident). The Los Angeles County Fire Department, Alhambra Fire Department, and surrounding fire agencies provided response times in similar terms. Through the presentations and discussions of response times, it became apparent that a comprehensive response time, listing all of the components that make up a response time, was not available and had not been identified or developed. Through discussions and interviews with various fire departments, it became apparent that each organization calculates their response times in various methods and there is no standard for response time or reflex time of responding emergency personnel. Up until recently, the type of data necessary to calculate all events associated with response times was not being captured into a database.

With the continued increase in questions of response times and to report quantified

response times, there became an organizational need to properly identify the various components that make up a response time. The evaluated variables of the response time for this study has been limited to time of entry, time of dispatch, and en route time.

The purpose of this research project is to determine the reflex time of responding emergency personnel and establish a reflex time standard. By establishing the components and developing a standard of measurement, the department will be able to more accurately account for response times from the time of entry to the time en route. The reflex time standard will be integrated into performance objectives of responding emergency personnel.

Evaluative and action research methodologies were used in this research to answer the following questions:

1. What is reflex time?
2. What components make up the reflex time?
3. What is the reflex time of responding personnel?
4. What is an acceptable reflex time standard?

BACKGROUND & SIGNIFICANCE

The City of Alhambra is a charter law city with a council/mayor form of government. The city is located in Los Angeles County, California. The city encompasses 7.64 square miles and makes up part of the San Gabriel Valley. Los Angeles City, on the east by the cities of San Gabriel and San Marino, on the north borders Alhambra on the west by South Pasadena and the south by Monterey Park.

The community has a population of approximately 90,000 people. The make-up of the community consists primarily of residential housing, a large retail area, and a small industrial area.

The Alhambra Fire Department has four fire stations that are geographically located in four equal parts of the city, creating four separate station jurisdictions. Station 1 houses and staffs one first-line engine company with three personnel, one first-line truck company with three personnel, one first-line paramedic ambulance with two personnel, one command vehicle staffed with one person, and one reserve truck. Total staffing at Station 1 per day is nine people. In addition, Station 1 consists of administrative personnel, including the fire chief, deputy fire chief, fire marshal, arson investigator, paramedic coordinator, two fire prevention specialists, and four secretarial personnel. Station 2 houses one first-line engine company staffed with three personnel and one reserve paramedic ambulance. Station 3 houses one first-line engine company staffed with three personnel and one reserve engine. Station 4 houses one first-line engine company staffed with three personnel and one paramedic ambulance staffed with two personnel. Minimum daily staffing for the fire department is 21 personnel.

The level of emergency medical services the Alhambra Fire Department currently provides is at the ALS level supported by BLS. The department staffs two paramedic ambulances with two paramedics, two BLS engine companies staffed with EMT's, and two paramedic assessment engine companies with limited ALS capabilities. These engine companies are staffed with at least one paramedic and two EMT's.

In 1924, the Alhambra Fire Department placed a fire dispatch center in service to better serve the community with the population growth and the increase of incidents. Over the next fifty-six years, the fire department provided a communications system to enhance response times to the community. Response time records were kept on responding units from the time dispatched out of the fire station until the time the units arrived on scene. There was no record of call taking or entry time of dispatchers in this early time period of the fire department.

On February 5, 1980, the Alhambra Fire Department consolidated its fire and emergency medical dispatching functions with the Alhambra Police Department dispatching to improve efficiency and cut cost. The police and fire dispatch basically kept the same type of record keeping as before with the exception of an upgrade to computer aided dispatching (CAD). The CAD system aided in more information on hydrant location, cross streets, and structure construction, but there was no specific break down on response times except for time of dispatch and time arrived.

In June of 1997, the police department upgraded the emergency dispatch center with new computer hardware and software. The new system is state-of-the-art in computer aided dispatching and data collection. The new system has a number of programs that

can provide additional statistical data and is able to capture specific events that make up the response time.

In the development stage of the new fire and police communication center the fire department was asked to identify their needs. There was an additional time field requested in anticipation of this study. The additional field was an en route time that is captured when a unit becomes en route to an incident. Each time a unit is dispatched they notify dispatch they are in en route and the dispatcher will enter this time into the event history. By adding this event of en route time enabled the department to analyze the response data and develop a reflex time standard for responding emergency personnel and equipment.

The research conducted will have a significant operational impact on how the Alhambra Fire Department calculates and reports future response times when conducting service level analyses.

Developing a reflex time standard will enable the department to account for and produce a more accurate respond time for reporting purposes. In addition to accounting for emergency responses, administration will develop and implement response time performance objectives incorporating a reflex time measurement.

This research paper addresses issues identified in the Executive Leadership Course unit 12: EVALUATING, analyze and develop strategies, which will affect outcomes.

LITERATURE REVIEW

The literature review was limited to the Learning Resource Center at the National

Emergency Training Center (NETC) and the local library. A limited amount of documents on the subject of reflex time for emergency responders was located. The literature review has emphasis on emergency response time lines, primarily in the time frames of receiving a 9-1-1 call and the components making up the initial response times of the emergency responders to mobilize.

Emergency response is more than just a component of public safety... it is the core. There is an obvious link between the time it takes for emergency response to be effected, and the outcome of most incidents. When a baby is not breathing, people are trapped in a burning building, or a crime is in progress, time becomes a critical factor. Our emergency communications centers can reduce that time and help save lives and property (Cole, 1991, p.20).

Measuring response time performance

In the EMS industry, there is no such widespread agreement about what “response time” is or how it should be measured. Public and private EMS providers prefer to be evaluated, not from the perspective of the patients they exist to serve, but from the far more comfortable point of view of their own internal operations. The draft report of a recent survey of the 30 most populous U.S. cities, conducted by the District of Columbia’s Productivity Management Staff, concluded in part that “There is no standard basis for the calculation of response time ... (in the EMS industry)” (Stout, 1987, p.106).

Many EMS providers, public and private, have for years operated without external monitoring and verification of response time performance. As a result, an arsenal of “scams” has been developed to create the illusion of reliable response time performance

even in EMS systems whose actual performance threatens the lives of substantial percentages of patients. Below is a partial listing and brief discussion of the most popular time reporting scams (Stout, 1987, p.107).

Scam #1: The Average Response Time: The most common and perhaps the most dangerous and misleading response time scam is the reporting of “average” response time performance. “Average” response-time statistics tell us what happen to about one-half of the patients. But what about the other half?

More scrupulous providers (and less gullible public officials) insist upon evaluations based upon “response time frequency distribution” statistics, rather than upon response time averages. *That is, they insist upon knowing the percentage of calls, which result in an acceptable response time performance.* If your city’s “average” response time is “acceptable,” then by definition, only about half of your citizens are receiving an “acceptable” level of service – the other half are not.

Scam #2: Provider-Friendly Response Time Definition: Next to the “average response-time scam,” the use of more flattering methods of calculation response-time results is probably the most common methods of covering up bad management and life-threatening performance. Pizza Hut’s “5-minute promise” clearly and in arguably implies that the clock starts when you have ordered your pizza and stops when your pizza arrives. EMS response time is no more of a mystery. The EMS clock starts when you have “ordered your EMS unit” and stops when your unit arrives.

All other time stamped events are recorded only for purposes of diagnosing and correcting causes of poor response-time performance. For example, you’ll never know if

long “out of the chute” times are causing response time delays unless you calculate the times between “time unit alert” and “time unit en route” (Stout, 1987, p.108).

In a number of document reviews, one of the critical components of response time measurement to consider is “unit alerted” to “unit en route” or “turnout time.” This measurement is identified numerous times in response time development and personnel performance review.

The International Association of Fire Chiefs, Accreditation Committee randomly selected 200 fire departments and forwarded a questionnaire to get data on two of three elements of Response Time. The three elements of Response Time for the purpose of the Accreditation Committee are:

Alarm Processing – Alarm processing is a period of time that is required for the Communications Center to identify the fact that an emergency is in progress, collect the information pertinent to making the appropriate dispatch, and access the metrology used by the agency to deploy resources.

Turnout Time – Turnout Time is the period of time it takes for the on-duty emergency system and hazardous material personnel to discontinue the activities they are engaged in, properly attire themselves, and board the vehicle in readiness for response. Turnout Time shall include the elapsed time between being notified that an emergency is in progress and the vehicle actually beginning to respond to the address or location that has been identified.

Travel Time - Travel time is the period of time once the wheels of apparatus begin its uninterrupted response and the actual time that the emergency response vehicle arrives at

the address or location to which it has been dispatched. Travel time includes driving distance and delays caused by misinformation in dispatch. Traffic obstructions and/or geographical obstacles. Response time ends when the vehicle is declared on scene by the first arriving unit officer.

A total of 57 fire agencies (55 U.S. and two foreign) responded including representation from 31 states. The responding agencies protect a population base of 11.4 million. A total of 271,403 alarms were reviewed for alarm processing and 91,027 alarms were reviewed for turnout time statistics (Rule, 1992, p.7). For the purpose of this review, departments serving 25,000 to 99,999 population was selected for like comparison with Alhambra Fire Department serving 90,000 people.

Departments with 25K to 99,999 population, (staffed and unstaffed) participating, 19 departments, each serving between 25,000 and 99,999 people, responded to the survey. These departments served an aggregate population of 827,742 people. A total of 18,530 alarms were reviewed by the responding departments for alarm processing. 20,005 alarms were reviewed by the respondents for turnout time (Rule, 1992, p.8).

Alarm processing, Turnout Time

Mean	57.11	56.56
Median	56	48
Mode	60	45
Std. Deviation	17.69	14.61
Range	21 to 91	32 to 80

These times can be used as a benchmark for local fire departments. The element

of Notification, Alarm Processing, and Travel Time, is the same for staffed and unstaffed fire departments. The difference will occur between staffed and unstaffed fire departments with regard to Turnout Time (Rule, 1996, p.8).

Turnout Time for staffed fire stations should be no more than one minute. Not enough data was received to set a standard for unstaffed stations. Local jurisdictions should set a standard for turnout time based on acceptable local conditions and monitor the times periodically (Rule, 1996, p.8).

Fire departments should check the various elements of their response time to assure quality control and customer service. Some emergency communications centers record times in minutes only, which allow a difference of 59 seconds. To get an accurate reflection of what is happening requires periodic sampling of times using a stopwatch to record actual times on communications center tapes (Rule, 1996, p.8).

Some fire departments may not have control over the operations of the communication/9-1-1 center. Another government or private sector agency may manage the system. Their policies may be counter-productive to fire and EMS response such as stacking or cuing calls, etc. Fire and EMS alarms increase in intensity with time and positive outcomes are usually experienced through early intervention. In most cases, 90% of calls to a combined dispatch center are Law Enforcement related; 90% of true emergencies are Fire/EMS Related (Rule, 1996, p.8).

PROCEDURES

For the purpose of this study, a 10% sample population of 4,734 incidents, producing 927 evaluated response times from the fiscal year July 1, 1997 to June 30, 1998. This time period was selected due to the upgrading of the dispatch center with new computer hardware and software in the newly constructed police station housing the dispatch center for police and fire dispatching. The data was analyzed to determine the components that make up a reflex time and develop a standard of measurement. The following selected components of the incident dispatch were identified as the measurements used to establish a reflex time and develop a standard for responding emergency personnel:

The type of incident (EMS, structure fires, etc.)

- Dispatch entry time till time of dispatch
- Dispatch time till time responding unit(s) is en route
- Individual components of elapse times between time dispatched to time en route from quarters.

The data collected was organized into tables representing the above sections to established a reflex time measurement: type of incident, reflex time for dispatchers (entry time to time dispatched), reflex time for first responders (time dispatch to time en route). The results were placed into tables and averaged.

The type of incidents are categorized into tables by the required Personal Protective Equipment (PPE) (Appendix C). This was necessary to compare like times of responders preparing to respond to incidents requiring the same type of PPE. Incident types 1 through 12, 17, 19, 20, 22, 25, and 26 require full PPE. Incident types 13, 14, 15, 16, and 24 require discretionary PPE. Incidents 18, 21, and 23, require PPE for medical treatment.

Data was collected from two different sources, one was timed events in the fire station and the second source is the dispatch center using the event history table that captures data of each individual incident (Appendix A). The event history table consisted of event history records, event remarks, event summary, event chronology, and unit summary. The data analyzed from the dispatch center was the event history records, event chronology, and unit summary sections of the event history table. These sections listed incident information and times for the time of entry, unit(s) responding, date/time of call, and status of each incident. The selected data entry evaluated was: type of incident (Incident Code), entry time (ENTRY), time dispatched (DSP), and en route time (ENR), these events were placed into spreadsheets and averaged. To compare with data from the dispatch center, additional times of actual and simulated en route response times (dispatch to en route) were randomly timed by supervisory personnel in each one of our four fire stations. The en route time was broke down into individual components identified within the time frame of dispatching units till the time the units are en route from quarters.

The following events were identified as the individual components within the en

route time frame when a dispatch is received in the fire station:

- The dispatcher will voice over the PA system to standby for a response
- Alarm tone is sounded
- The dispatcher will voice over the PA system the type of incident and location
- The responding personnel will acknowledge the response
- Responding personnel prepare for incident donning appropriate protective personal equipment
- Responders secure themselves in the vehicle
- Start the vehicle
- Respond to location

When this series of events is completed, the unit(s) responding will notify dispatch they are en route. The events listed above were categorized into three sections and timed during actual and simulated responses from quarters. The times were averaged for each of the sections and placed into a table. The following three sections represents the categorized components of the dispatch till en route:

- Dispatcher voices to stand by for call, alarm tone sounded, dispatcher voices responding unit, type and location of incident.
- Responders acknowledge dispatch.
- Responders prepare for incident with PPE, secure in vehicle, and respond.

The selected data was averaged together to develop a reflex time measurement from the time of dispatch to the time emergency responders are en route. The reflex time represents a measurement in service levels as related to the timed events in delivering services and establishes a performance objective in response times for responding emergency personnel.

There were a number of limitations to this study.

1. Times for donning special PPE was not included in this study and this will need to be address in policy development.
2. Reflex time for units in the field (on the radio) was not considered for this study.
3. During the timing of reflex time in the fire stations and monitoring the radio, there was a noted problem in reporting the en route time to dispatch. When multiple units were responding, they would report to dispatch at the same time covering each other on the radio creating delays in recording the en route time. There is an assumption that this limitation will have an impact on data received from the dispatch center. This variable is not calculated into the results.

RESULTS

For the purpose of this study, a 10% sample population of 4,734 incidents, producing 927 evaluated response times from the fiscal year July 1, of 1997 to June 30, 1998, was collected from the dispatch center using the event history table that captures data of each individual incident (Appendix A). The event history table consist of event history records, event remarks, event summary, event chronology, and unit summary. The data analyzed for this study was collected from the event history records, event chronology, and unit summary sections of the event history table. These sections listed incident information and times for the time of entry, unit(s) responding, date/time of call, and status of each incident. The selected data entry evaluated was: type of incident (incident code, Appendix B), entry time

(ENTRY), time dispatched (DSP), and en route time (ENR), these events were placed into spreadsheets, averaged and placed into tables. The required personal PPE, categorized the type of incidents (Appendix B). This was necessary to compare like times of first responders preparing to respond to incidents requiring the same type of PPE. The results are represented in the following narratives and tables:

Table 1 represents the overall average of 927 time entries from the history event table (Appendix A). The averages in this table provide comparative averages for entry time till dispatched, dispatch time till en route, and entry time till en route. The significance of these averages is limited to a general comparison of more detailed data in the proceeding tables.

TABLE 1 Incident types with comparative averages of entry time till dispatched, dispatch time till en route, and entry time till en route				
Incident code	Incident Description	Entry time till time dispatched	Dispatch time till unit en route	Entry time till en route Time
1	STRUCTURE FIRES	0:01:04	0:03:26	00:04:26
2	VEHICLE FIRES	0:01:08	0:02:40	00:03:48
3	VEGETATION FIRES	0:00:50	0:02:27	00:03:18
4	TRASH FIRES	0:00:22	0:02:52	00:03:14
5	FIRES NON-STRUCT/MISC.	0:00:19	0:02:55	00:03:14
6	ILLEGAL BURNINGS	0:00:35	0:01:57	00:02:32
7	FUEL SPILLS	0:02:08	0:01:03	00:03:12
8	HAZ MAT INCIDENTS	0:00:21	0:02:29	00:02:50
9	RESCUES/NON MEDICAL	0:02:06	0:02:34	00:02:31
10	NATURAL GAS LEAKS	0:00:40	0:02:03	00:02:44
11	WIRES DOWN/ARCING	0:00:35	0:01:53	00:02:30
12	ODOR/SMOKE INVEST.	0:01:38	0:02:29	00:05:04
13	FLOODING/WATER REM.	0:00:39	0:03:52	00:04:24
14	ASSIST ENTRY CALLS	0:00:56	0:02:04	00:03:00
15	TREES/BRANCHES DOWN	0:01:03	0:02:32	00:03:36
16	ASSIST P.D.	0:00:28	0:02:18	00:05:23
17	FIRE ALARM OFF	0:00:43	0:03:11	00:03:54
18	MEDICAL BASIC LIFE SUPPORT	0:00:18	0:03:00	00:03:18
19	FALSE ALARMS	0:00:27	0:03:19	00:03:46
20	MUTUAL AID – FIRES	0:00:35	0:01:45	00:02:20
21	MEDICAL EMERGENCIES	0:00:25	0:03:11	00:03:36
22	INITIAL ACTION CALLS	0:00:22	0:01:46	00:02:08
23	MUTUAL AID – MEDICAL	0:00:22	0:02:08	00:02:30
24	SPECIAL ASSIGNMENTS	0:03:55	0:02:31	00:06:26
25	TRAFFIC COLLISIONS – EMS	0:00:28	0:02:22	00:02:50
26	CO MONITOR ACTIVATIONS	0:00:19	0:02:41	00:03:00
	AVERAGE	0:00:35	0:03:00	0:03:38

Tables 2, 3, and 4, are categorized by the type of incidents with average times of incidents requiring PPE. This data is used to compare like times of first responders preparing to respond to incidents requiring the same type of PPE. Incident types 1 through 12, 17, 19, 20, 22, 25, and 26 require full protective personal equipment. Incident types 13, 14, 15, 16, and 24 is discretionary PPE. Incidents 18, 21, and 23 require PPE for medical treatment

TABLE 2 Incident types 1 through 12, 17, 19, 20, 22, 25, and 26, require full protective personal equipment.				
Incident code	Incident Description	Entry time till time dispatched	Dispatch time till unit en route	Entry time till en route Time
1	STRUCTURE FIRES	0:01:04	0:03:26	00:04:26
2	VEHICLE FIRES	0:01:08	0:02:40	00:03:48
3	VEGETATION FIRES	0:00:50	0:02:27	00:03:18
4	TRASH FIRES	0:00:22	0:02:52	00:03:14
5	FIRES NON-STRUCT/MISC.	0:00:19	0:02:55	00:03:14
6	ILLEGAL BURNINGS	0:00:35	0:01:57	00:02:32
7	FUEL SPILLS	0:02:08	0:01:03	00:03:12
8	HAZ MAT INCIDENTS	0:00:21	0:02:29	00:02:50
9	RESCUES/NON MEDICAL	0:02:06	0:02:34	00:09:31
10	NATURAL GAS LEAKS	0:00:40	0:02:03	00:02:44
11	WIRES DOWN/ARCING	0:00:35	0:01:53	00:02:30
12	ODOR/SMOKE INVEST.	0:01:38	0:02:29	00:05:04
17	FIRE ALARM OFF	0:00:43	0:03:11	00:03:54
19	FALSE ALARMS	0:00:27	0:03:19	00:03:46
20	MUTUAL AID – FIRES	0:00:35	0:01:45	00:02:20
22	INITIAL ACTION CALLS	0:00:22	0:01:46	00:02:08
25	TRAFFIC COLLISIONS – EMS	0:00:28	0:02:22	00:02:50
26	CO MONITOR ACTIVATIONS	0:00:19	0:02:41	00:03:00
	AVERAGE	0:00:50	0:02:23	00:03:37

Table 3 represents non life-threatening type of incidents and has a wide variety of response times. The averages are basically insignificant and have limited consideration in the development of a reflex time.

TABLE 3 Incident types 13, 14, 15, 16, and 24 is discretionary PPE				
Incident code	Incident Description	Entry time till time dispatched	Dispatch time till unit en route	Entry till en route time
13	FLOODING/WATER REM.	0:00:39	0:03:52	00:04:24
14	ASSIST ENTRY CALLS	0:00:56	0:02:04	00:03:00
15	TREES/BRANCHES DOWN	0:01:03	0:02:32	00:03:36
16	ASSIST P.D.	0:00:28	0:02:18	00:05:23
24	SPECIAL ASSIGNMENTS	0:03:55	0:02:31	00:06:26
	AVERAGE	0:01:24	0:02:40	00:04:29

TABLE 4 Incidents types 18, 21, and 23, require minimum PPE				
Incident code	Incident Description	Entry time till time dispatched	Dispatch time till unit en route	Entry time till en route Time
18	MEDICAL BASIC LIFE SUPPORT	0:00:18	0:03:00	00:03:18
21	MEDICAL EMERGENCIES	0:00:25	0:03:11	00:03:36
23	MUTUAL AID – MEDICAL	0:00:22	0:02:08	00:02:30
	AVERAGE	0:00:22	0:02 :45	00:03:08

To compare with data from the dispatch center, additional times of actual and simulated en route response times (dispatch to en route) were randomly timed by supervisory personnel in each one of our four fire stations. The en route time was broken down into individual components within the en route time frame. The following tables represent events that are identified as the individual components that make up the en route time when a dispatch is received in quarters. When this series of events is completed, the

unit(s) responding will notify dispatch they are en route.

Table 5 represents 20 (10 requiring full PPE, 10 requiring minimum PPE) timed dispatches of actual and simulated responses from quarters.

TABLE 5 Individual components evaluated to establish the en route time (reflex time) of first responders in quarters			
DISPATCH	ACKNOWLEDGE	EN ROUTE FULL PPE	EN ROUTE MINIMUM PPE
0:00:19	0:00:21	0:00:65	0:00:45
0:00:24	0:00:30	0:00:89	0:00:38
0:00:11	0:00:18	0:00:82	0:00:23
0:00:21	0:00:29	0:00:72	0:00:41
0:00:28	0:00:15	0:00:93	0:00:47
0:00:36	0:00:22	0:00:65	0:00:38
0:00:22	0:00:15	0:00:99	0:00:72
0:00:20	0:00:17	0:00:95	0:00:43
0:00:19	0:00:22	0:00:70	0:00:46
0:00:15	0:00:26	0:00:76	0:00:43
AVERAGE			
0:00:22	0:00:22	0:01:21	0:00:44

The averages from table 5 are categorized into three sections in table 6 representing the reflex time measurement: Section one, **dispatch** (dispatcher voices to stand by for call, alarm tone sounded, dispatcher voices responding unit, type and location of incident).

Section two, **acknowledge** (responders acknowledge dispatch). Section three, **en route** (responders prepare for incident with PPE, secure in vehicle, and respond).

Table 6 represents the averaged times from table 5 and placed into three sections (dispatch time, acknowledgment, dressed in PPE and responding), the significant times in this table are the total times. The total times represent the reflex time of responding emergency personnel from quarters.

TABLE 6		
This table represents the reflex time of responding emergency personnel from quarters.		
Averaged evaluated times of dispatch, acknowledgment and en route used to establish a reflex time measurement	Averaged components of en route times requiring full PPE	Averaged components of en route times requiring min. PPE
Dispatcher voices to stand-by for call, alarm tone sounded, dispatcher voices responding unit (s), type and location of incident.	0:00:22	0:00:22
Responder acknowledges dispatcher	0:00:22	0:00:22
Responders prepare for incident with required PPE; responders secure in vehicle, start vehicle, and respond.	0:01:21	0:00:44
Average times added together to establish REFLEX TIME	0:02:05	0:01:28

Table 7 represents the collected times and averages that are significant to evaluate in terms of developing a reflex time standard.

TABLE 7			
This table lists the averages from the dispatch till en route sections in tables 1, 2, 4, and 6.			
	Dispatch center times	Fire station times	Percentage difference
En route full PPE	0:02:23 (table 2)	0:02:05 (table 6)	13%
En route minimum PPE	0:02:45 (table 4)	0:01:28 (table 6)	47%
Combined average of all incidents types	0:03:00 (table 1)	0:01:47 (column aver.)	46%

There are a number of significant results to this study. The most significant development in this study is the establishment of a measurement and the identified components making up the reflex time. The reflex time measurement can be developed into policy and standardized as part of the overall response time to emergency incidents.

The significant evaluated times were the dispatch time till unit en route time. These are significant times because they represent the important time elements that establish a reflex time measurement for responding emergency personnel. The comparison in table 7 of data from the dispatch center and the times that were taken at the fire stations by department supervisors indicated a 46% difference in reflex time. The significant figures to look at are the differences in dispatch en route times in comparison of preparing to respond in full PPE or minimum PPE. In table 2 the average dispatch en route times from the dispatch center is 0:02:23, in table 4 the average dispatch till en route times is 0:02:45, this is a 10% increase in reflex time. The significance in this comparison is the average for the minimum PPE is higher than the average for the full PPE. This comparison could possibly indicate that responding personnel have become complacent and lack a sense of urgency for emergency medical calls (minimum PPE) when comparing with fire calls (full PPE). When these same sections are compared in table 5 and 6, there is a 30% decrease in reflex time and this appears to be a direct result of capturing the times in the fire station as opposed to the dispatch center data. There were noted errors in the data review and observed delays and operational errors by dispatchers making data entries and en route acknowledgment by responding personnel. The data developed from the times taken in the fire stations are more likely to reflect the true reflex time because of the noted errors in

the data received from the dispatch center and listed limitations.

There is a 13% difference between the dispatch center average and the timed events requiring full PPE. Comparisons of averages from all tables requiring full PPE are within acceptable limits in both dispatch center data and times developed from the fire stations. The most significant percentage difference is between the dispatcher center average and the timed events in quarters requiring minimum PPE. The percentage is 47%, again this indicates a complacency and/or responder's lacking a sense of urgency for emergency medical calls (minimum PPE) when comparing with fire calls (full PPE).

The results clearly indicate a disparity between en route times from the fire stations and the dispatch center. The results support the development of a reflex time standard to provide a more accurate accounting of response times and set performance objectives for emergency responders.

DISCUSSION

In 1997, the city and the fire department was challenged to consolidate their fire and EMS service with the Los Angeles county fire protection district. The thrust of the consolidation initiative was service levels for fire and emergency medical service. These challenges brought the service levels to the forefront and heightened the level of awareness in the community. The citizens were asked to analyze and decipher through the complexities of providing fire and EMS protection to the community. The community voted overwhelmingly to maintain their current level of fire and EMS service.

Prior to the vote, the fire department was questioned as to what is the response time for fire and EMS incidents in comparison to other fire departments. A general review

of other surrounding fire agencies was conducted and the emergency responses were mostly reported from the time of dispatch until the time of arrival. It was noted there is little concern or defined data to compare against in identifying the individual components (turnout time or reflex time) that make up an emergency response. From an organizational standpoint, it became a necessity to analyze and identify an entire response time from the time a call is received until units arrive on scene. For the purpose of this study, the response component is limited to identifying and developing a reflex time for responding emergency personnel.

During the literature review, there was a number of articles and a study conducted by the International Association of Fire Chiefs that provided information on alarm processing and turnout time (reflex time). The information gave a general comparison on alarm processing and turnout time from 57 (55 U.S. and two foreign) fire departments. The literature reviews impacted the process used and format of response time lines identified in reviewed studies and articles. This study used similar methods to analyze data and develop timed measurements for the Alhambra Fire Department. This study expanded to include emergency medical responses and categorized responses by the required PPE .

An unexpected finding in this study was the change in response time performance. Personnel were not informed of the study being conducted for the purpose of obtaining current reflex times. During the process of collecting dispatch times till en route times in the fire stations, it was observed that once personnel became aware they were being timed, the timed components used to measure the reflex times decreased significantly. At times, the individual components of reflex time decreased by 60%. This reaction by responding

personnel along with data review indicates and lends support to the development of a reflex time standard to better define organizational performance expectations.

RECOMMENDATIONS

It is recommended that a reflex time standard be developed and implemented based upon the findings in this study. The study clearly indicates a disparity between the response times from the fire stations and the dispatch en route times and further evaluation is recommended. It is probable the disparity between the response times from the fire stations and the dispatch en route times would be eliminated with the development of a reflex time standard.

The results support the development of a reflex time standard to provide a more accurate accounting of response times and set performance objectives for emergency responders.

The following recommendations should be considered:

- Institutionalize the reflex time as a critical component in reporting and accounting for the total response time.
- Develop reflex time standard from the findings of this study to establish department and emergency responder performance objectives.
- Use identified reflex time measurements to develop standard.
- Develop standard categorized by type of incident and required PPE.
- Further evaluate the dispatch center operations for data entry.
- Explore the use of mobile data terminals to eliminate the reporting problem of multiple units en route at the same time.

REFERENCES

- Cole, David. (1991, March) The Emergency Response Time-line. 9-1-1 Magazine 20.
- Rule, Charles H. (1992, September 1). IAFC Accreditation Committee surveys fire department, charts response times. IAFC On Scene, 16, 7-8
- Rule, Charles H. (1996, November/December) . The Five Minute Response. Wisconsin Fire Journal, 8.
- Stout, Jack L. (1987, September). Measuring Response Time Performance. Jems 106-108.

APPENDIX A

EVENT HISTORY TABLE

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Form: EHQ
Requested By: APD/702 At Position: EAGLE5

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EVENT HISTORY TABLE

EVENT HISTORY RECORDS

Event #: AFD9802137 Priority: 1
Time: 19-Jun-98/23:43:05 Type: 21
Response Level: 1
Src: 9 Loc: 912 E ROSS AV ,ALH
Info: Caller: LEM CHHENG
Phone: (626) 282-2195

EVENT REMARKS

19-Jun-98/23:43:05 634 EAGLE2
Structure Information

AREA: RESIDENTIAL

STRUC: SINGLE FAM

DESCRIPTION: SNG UNIT

SINGLE ST. STUCCO W/ COMPO ROOF.

HYDRANT: 75'+ E OF STRUC ON OPP. SIDE.

EVENT SUMMARY

Status	Status Date	By	At
-----	-----	-----	-----
CLS	20-Jun-98/00:11:27	603 EAGLE2	
DSP	19-Jun-98/23:43:20	634 EAGLE2	
ENR	19-Jun-98/23:46:20	634 EAGLE2	
ONS	19-Jun-98/23:49:47	634 EAGLE2	
WAI	19-Jun-98/23:43:05	634 EAGLE2	

EVENT CHRONOLOGY

Date/Time	Segment Name	Workstation	Description
-----	-----	-----	-----
19-Jun-98/23:43:05	ENTRY	EAGLE2	
19-Jun-98/23:43:20	DSP	EAGLE2	E72 (ENG) M74 (MED)
19-Jun-98/23:43:20	PRIUNIT	EAGLE2	E72
19-Jun-98/23:46:20	ENR	EAGLE2	M74
19-Jun-98/23:46:20	ENR	EAGLE2	E72
19-Jun-98/23:49:47	ONS	EAGLE2	E72
19-Jun-98/23:49:47	PRIUNIT	EAGLE2	E72 \$AFD
19-Jun-98/23:52:44	ONS	EAGLE2	M74
19-Jun-98/23:52:44	PRIUNIT	EAGLE2	M74 \$AFD
19-Jun-98/23:54:37	CLEAR	EAGLE2	E72
20-Jun-98/00:11:27	CLEAR	EAGLE2	M74
20-Jun-98/00:11:27	CLOSE	EAGLE2	

UNIT SUMMARY

Unit	Date/Time	Status
-----	-----	-----
E72	19-Jun-98/23:43:20	DSP
E72	19-Jun-98/23:46:20	ENR
E72	19-Jun-98/23:49:47	ONS
E72	19-Jun-98/23:54:37	AV
M74	19-Jun-98/23:43:20	DSP
M74	19-Jun-98/23:46:20	ENR
M74	19-Jun-98/23:52:44	ONS
M74	20-Jun-98/00:11:27	AV

APPENDIX B

TYPE OF INCIDENTS

This is a table of incident codes and descriptions used by the communications center and fire department for categorizing incidents and reports.

INCIDENT CODE	INCIDENT DESCRIPTION
1	STRUCTURE FIRES
2	VEHICLE FIRES
3	VEGETATION FIRES
4	TRASH FIRES
5	FIRES NON-STRUCT/MISC.
6	ILLEGAL BURNINGS
7	FUEL SPILLS
8	HAZ MAT INCIDENTS
9	RESCUES/NON MEDICAL
10	NATURAL GAS LEAKS
11	WIRES DOWN/ARCING
12	ODOR/SMOKE INVEST.
13	FLOODING/WATER REM.
14	ASSIST ENTRY CALLS
15	TREES/BRANCHES DOWN
16	ASSIST P.D.
17	FIRE ALARMS OFF
18	MEDICAL BASIC LIFE
19	FALSE ALARMS
20	MUTUAL AID - FIRES
21	MEDICAL EMERGENCIES
21D	MEDICAL EMERGENCIES
22	INITIAL ACTION CALLS
23	MUTUAL AID - MEDICAL
24	SPECIAL ASSIGNMENTS
25	TRAFFIC COLLISIONS - EMS
26	CO MONITOR ACTIVATIONS

APPENDIX C

PERSONAL PROTECTIVE EQUIPMENT DIRECTIVE

ALHAMBRA FIRE DEPARTMENT



PERSONAL PROTECTIVE EQUIPMENT EVOLUTION

DONNING PERSONAL PROTECTIVE EQUIPMENT WITH PASS AND SELF CONTAINED BREATHING APPARATUS

NAME _____ EMP# _____ DATE _____
_____ STATION _____ SHIFT _____

- OBJECTIVE:**
1. To don Personal Safety Equipment and Self Contained Breathing Apparatus (S.C.B.A.) in a safe, efficient manner, following Department procedures.
 2. To answer general information questions about the P.A.S.S. unit and the S.C.B.A.
 3. To record the time taken to don personal safety equipment with the S.C.B.A.

EQUIPMENT: Chair, Personal Safety Equipment, P.A.S.S unit and a S.C.B.A.

DESCRIPTION OF EVOLUTIONS:

Given: Wearing departmental work uniform, Personal Safety Equipment with P.A.S.S. unit, and a Self Contained Breathing Apparatus ready to don. This equipment will be arranged in front of member.

1. Answer general questions about the P.A.S.S. unit and the Self Contained Breathing Apparatus.
2. Rater signals member to don personal safety equipment activate P.A.S.S., and don a Self Contained Breathing Apparatus.
3. Assessment stops when member signals task is completed.
4. The rater shall record the time on the individual skills assessment grade sheet.

INDIVIDUAL SKILLS ASSESSMENT

NAME _____ Empl. # _____ Date _____ Sta. _____ Shift _____

INDIVIDUALS NOT MEETING THE INDIVIDUAL SKILLS STANDARD WILL REQUIRE ADDITIONAL TRAINING IN THAT SKILL.

ASSESSMENT AREAS			
INDIVIDUAL HAS MET THE STANDARD:	YES	NO	COMMENTS
Answers questions about the P.A.S.S. unit and S.C.B.A.			
Dons protective hood per instructions			
Dons Personal Safety Equipment closing all snaps and throat strap			
Activates P.A.S.S. unit			
Dons helmet, chin strap on			
Open cylinder on S.C.B.A.			
Don S.C.B.A. and adjust all straps			
Loosen chin strap on helmet, move helmet to the rear			
Don face piece use 10 second seal check			
Don protective hood			
Don and secure helmet			
Don gloves, signal completed			
TIME OF EVOLUTION			

RATER

